

Clinical Pearl 81

What Is The Best Location for Needle Decompression of a Pneumothorax

Case: A 58 year-old male who was the restrained driver of a vehicle struck on the driver's side with no LOC, no airbag deployment and no other injured parties. The patient is complaining of shortness of breath and left sided chest pain. The patient appears to be in mild respiratory distress on arrival. During the history and while obtaining vitals the man becomes increasingly short of breath and anxious appearing. Initial vitals: HR: 101bpm, RR: 20, SpO2: 98% and BP: 125/80. During your physical exam decreased breath sounds are appreciated over the left chest and no bleeding, ecchymosis or deformities are noted. You now appreciate moderate retractions with his inspirations, JVD, a distended left chest wall and tracheal deviation to the right with repeat vitals: HR: 135bpm, RR: 28, SpO2: 94% and BP: 95/70.

The current Advanced Trauma Life Support (ATLS) guidelines for tension pneumothorax recommend needle thoracostomy (NT) with a 5cm angiocatheter at the second intercostal space (ICS2) in the midclavicular line (MCL) over the affected side of the chest ⁽¹⁾.

Over the past couple of decades the US military has made identifying preventable causes of death a priority and identified tension pneumothorax as the second leading cause of preventable death in combat behind hemorrhage from isolated limb loss. Due to the identification of being a major cause of preventable casualties in combat, research has been advancing on the subject of tension pneumothorax⁽²⁻⁴⁾. Research has shown that a 5cm angiocatheter may not be of adequate length to reach the pleural space and that the ICS2-MCL may not be the best location for needle decompression ⁽⁵⁻⁸⁾.

Studies in both civilian and military populations have shown that using a 5cm angiocatheter results in only a 50-75% success rate in gaining access to the pleural cavity ^(5,6). Autopsy studies conducted by the military in service members demonstrated an angiocatheter of at least 8cm to penetrate the chest wall and gain access to the pleural cavity with a 99% success rate ^(6,7). This need in the military population for longer angiocatheters to increase the success rate of entering the pleural cavity can easily be translated to the civilian population where treatment guidelines must include all body habitus types in a population. Studies utilizing computed tomography have shown that the area of minimal chest wall thickness to be the fourth or fifth intercostal space (ICS4/5) at the anterior axillary line (AAL) ⁽⁸⁾. Studies have also shown higher success rates and fewer complications utilizing the ICS4/5-AAL when compared to the ICS2-MCL for NT ⁽⁸⁾. There may also be a decreased chance of lung injury at the ICS4/5-AAL as compared to the ICS2-MCL because a Pneumothorax would have to be very large to have the airspace make it all the way to the ICS2-MCL. Although air in the pleural space from a pneumothorax can collect anteriorly to the lung, laterally or both.

We currently recommend a 14 or 16 gauge 8cm (3.15 inch) angiocatheter at the ICS4/5-AAL inserted perpendicular to the skin for needle decompression in pneumothorax.

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References:

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